REMARKS/ARGUMENTS

Claims 1-28 were previously pending in the application. Claims 2 and 16 are canceled, claims 1, 3-15, and 17-28 are amended and new claims 29-30 are added herein. Assuming the entry of this amendment, claims 1, 3-15, and 17-30 are now pending in the application. The Applicant hereby requests further examination and reconsideration of the application in view of the foregoing amendments and these remarks.

Claim Objections

In paragraph 2 of the office action, the Examiner objected to claims 2-14 and 16-28 because of certain informalities. In response, the Applicant has amended the claims as suggested by the Examiner. None of these amendments were made to overcome any prior art.

Claim Rejections - 35 U.S.C. 112

In paragraph 4, the Examiner rejected claims 10-11 under 35 U.S.C. 112, second paragraph, as being indefinite. In response, the Applicant has amended claims 10-11 to ensure that they are not indefinite. Claims 12 and 24-26 have been similarly amended. None of these amendments were made to overcome any prior art.

In paragraph 5, the Examiner rejected claims 15-28 under 35 U.S.C. 112, second paragraph, as being indefinite. In response, the Applicant has amended the claims to ensure that claims 15-28 are not indefinite. None of these amendments were made to overcome any prior art.

Claim Rejections - 35 U.S.C. 102(e)

In paragraph 7, the Examiner rejected claims 1-4, 6-18, and 20-28 under 35 U.S.C. 102(e) as being anticipated by Shinomiya. In paragraph 8, the Examiner objected to claim 5 as being dependent upon a rejected base claim, but indicated that claim 5 would be allowable if rewritten in independent form. In paragraph 9, the Examiner stated that claim 19 would be allowable if rewritten or amended to overcome the rejection(s) under Section 112, second paragraph. For the following reasons, the Applicant submits that all of the now-pending claims are allowable over Shinomiya.

Claims 1 and 15

Claim 1 has been amended to clarify differences between the claimed invention and the teachings in Shinomiya. Support for the amendments to claim 1 is found, for example, in original (now canceled) claim 2.

According to currently amended claim 1, one or more demands for service are received in a mesh network comprising a plurality of nodes interconnected by a plurality of links. A threshold is specified corresponding to a number of failure-related cross-connections. Each of the one or more demands is mapped onto a primary path and a restoration path in the network to generate a path plan for the one or more demands in the network. Reduction of a portion of restoration time associated with failure-related cross-connections in the network is taken into account during the mapping. The mapping generates the path plan based on the specified threshold such that, for all nodes in the mesh network, the number of failure-related cross-connections at each node is less than the specified threshold.

Shinomiya teaches a protecting route design method that searches for a protecting route that minimizes the transfer time of a failure notification message from a failure detection node. See, e.g.,

Abstract, lines 7-10. When a failure, such as link failure 11 in Shinomiya's Fig. 1, occurs in a network, the existence of that failure will be first detected at the functioning node immediately downstream of the failure, such as Shinomiya's node 12. That failure detection node then transmits a failure notification message, such as Shinomiya's failure notification message 13, which message gets forwarded to all appropriate nodes in the network. The transfer time of a failure notification message from a failure detection node is the total amount of time that it takes for the failure notification message to be forwarded from the failure detection node to all of the appropriate nodes. Shinomiya's protecting route design method minimizes this transfer time.

Claim 1 has been amended to clarify that the path plan of claim 1 is generated taking into account the <u>number of failure-related cross-connections at each node</u> in the network, to distinguish claim 1 from Shinomiya, where protecting routes are designed taking into account the <u>transfer time of a failure notification message from a failure detection node</u>.

The transfer time of a failure notification message from a failure detection node to other nodes in a network is very different from the number of failure-related cross-connections at a single node. As explicitly described on page 1, lines 25-26, of the present specification, the number of failure-related cross-connections at a node corresponds to the number of cross-connections that need to be performed at that single network element in the event of a failure in the network. The transfer time of a failure notification message from a failure detection node is related to (1) the number nodes between the failure detection node and the last node to receive the failure detection message, (2) the processing capabilities of those nodes, and (3) the length of the links between those nodes. See, e.g., Shinomiya, column 10, line 45, to column 11, line 13. This is very different from the number of cross-connections that need to be performed at a single network node.

For all these reasons, the Applicant submits that currently amended claim 1 is allowable over Shinomiya. For similar reasons, the Applicant submits that currently amended claim 15 is allowable over Shinomiya. Since claims 3-14 and 17-28 depend directly or indirectly from claims 1 and 15, it is further submitted that those claims are also allowable over Shinomiya.

<u>Claims 3 and 17</u>

According to claim 3, the mapping results in a maximum number of failure-related cross-connections at all nodes in the network being within a specified tolerance of a theoretical minimum. In rejecting claim 3, the Examiner cited column 6, lines 62-67, and column 8, lines 47-52, of Shinomiya.

The passage at column 6, lines 62-67, relates to preparing spare wavelengths in case they are needed due to a failure of a working wavelength. This passage has nothing to do with keeping a maximum number of failure-related cross-connections at all nodes in the network being within a specified tolerance of a theoretical minimum.

The passage at column 8, lines 47-52, relates to the deletion of (i) nodes that exceed the upper limit of restoration time and (ii) links that have no sharable spare wavelengths. The upper limit of restoration time is a maximum threshold for restoration time. In general, there are lots of ways to determine a maximum threshold. There is no teaching or even suggestion in Shinomiya that the upper limit of restoration time is determined based on a specified tolerance of a theoretical minimum value of restoration time. Furthermore, Shinomiya's upper limit relates to restoration time, <u>not</u> to the number of failure-related cross-connections at a single node.

The Applicant submits that this provides additional reasons for the allowability of claim 3 and similarly of claim 17, and therefore claims 4-5 and 18-19, which depend variously from claims 3 and 17, over Shinomiya.

Claims 4 and 18

According to claim 4, a graph-theoretic condition is used to derive the theoretical minimum. In rejecting claim 4, the Examiner cited column 6, lines 52-55 and column 8, lines 47-52.

The passage at column 6, lines 52-55, relates to the distribution condition and communication capacity of a working communication route. There is no mention of using a graph-theoretical condition to derive a theoretical minimum for the number of failure-related cross-connections at a single node.

The passage at column 8, lines 47-52, relates to the deletion of (i) nodes that exceed the upper limit of restoration time and (ii) links that have no sharable spare wavelengths. Here, too, there is no mention of using a graph-theoretical condition to derive a theoretical minimum for the number of failure-related cross-connections at a single node.

As described in the previous section, Shinomiya does not even suggest a theoretical minimum for any parameter, let alone using a graph-theoretic condition to derive a theoretical minimum for the number of failure-related cross-connections at a single node.

The term "graph-theoretical" is a term of art that, in the context of the present invention, refers to the analysis of a real-world communication network using graph theory. Shinomiya does not teach or even suggest such analysis.

The Applicant submits that this provides additional reasons for the allowability of claim 4 and similar of claim 18, and therefore claims 5 and 19, which depend from claims 4 and 18, over Shinomiya.

Claims 6 and 20

According to claim 6, the mapping sequentially evaluates each possible path plan for each of the one or more demands and selects the path plan having a smallest maximum number of failure-related cross-connections. In rejecting claim 6, the Examiner cited column 4, lines 22-27; column 6, lines 63-67; and column 7, lines 10-13, of Shinomiya. In particular, the Examiner cited column 4, lines 22-27, as teaching "the mapping sequentially evaluates each possible path plan."

According to column 4, lines 22-27, after a failure, a communication route is switched over in parallel, according to the predetermined protecting route information. According to such a pre-plan type failure restoration system, it is intended to decrease the number of failure notification messages, as well as performing the switchover in parallel, aiming to reduce a restoration time.

The Applicant does not understand how the passage at column 4, lines 22-27, can be legitimately interpreted as teaching a mapping that sequentially evaluates each possible path plan. There is no mention at all in the cited passage as to how the "pre-plan" is generated, let alone being generated by sequentially evaluating each possible path plan.

The Applicant submits that this provides additional reasons for the allowability of claim 6 and similarly of claim 20 over Shinomiya.

Claims 7 and 21

According to claim 7, the mapping comprises (1) selecting two node-disjoint paths for each demand, wherein leveling of link loads is taken into account during the selecting, and (2) for each demand, identifying one of the two node-disjoint paths as the primary path and the other as the restoration path, wherein a maximum number of failure-related cross-connections at all nodes in the network is taken into account during the identifying.

In rejecting claim 7, the Examiner cited column 6, lines 52-55, of Shinomiya as teaching the leveling of link loads. As mentioned previously, the passage at column 6, lines 52-55, relates to the distribution condition and communication capacity of a working communication route. There is no mention of the leveling of link loads.

The Applicant submits that this provides additional reasons for the allowability of claim 7 and similarly of claim 21 over Shinomiya.

New Claims 29-30

New claim 29 is equivalent to previously pending claim 5 rewritten in independent form. Since the Examiner stated that previously pending claim 5 would be allowable if rewritten in independent form, the Applicant submits that new claim 29 is allowable.

New claim 30 is equivalent to previously pending claim 19 rewritten in independent form. Since the Examiner stated that previously pending claim 19 would be allowable if rewritten in independent form, the Applicant submits that new claim 30 is allowable.

Conclusion

For the reasons set forth above, the Applicant respectfully submits that the rejections of claims 1-4, 6-18, and 20-28 under Sections 102(e) have been overcome. Furthermore, new claims 29-30 patentably define over the cited references.

In view of the above amendments and remarks, the Applicant believes that the now-pending claims are in condition for allowance. Therefore, the Applicant believes that the entire application is now in condition for allowance, and early and favorable action is respectfully solicited.

Respectfully submitted,

Steve Mendelsohn

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Customer No. 46850
Mendelsohn & Associates, P.C.
1500 John F. Kennedy Blvd., Suite 405
Philadelphia, Pennsylvania 19102

Steve Mendelsohn
Registration No. 35,951
Attorney for Applicant
(215) 557-6657 (phone)
(215) 557-8477 (fax)